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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/724,133	12/01/2003	Joon Hyeon Lee	P69337US0	1214

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JACOBSON HOLMAN PLLC  
400 SEVENTH STREET N.W.  
SUITE 600  
WASHINGTON, DC 20004

EXAMINER

DEO, DUY VU NGUYEN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 12/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/724,133	Applicant(s) LEE, JOON HYEON	
	Examiner DuyVu n. Deo	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 October 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 October 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 4, 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Liu et al. (US 6,117,345).

Liu teaches a method for forming wiring lines comprising: depositing a metal layer 24 on a semiconductor structure (col., line 50-64); forming an insulating layer 28 and a photoresist on the metal layer (col. 4, line 30-40); patterning the insulating layer 28 using the pattern photoresist pattern to form an etching mask (col. 7, line 37-42); etching the metal line by using the photoresist and the insulating layer as a mask with gas mixture comprises Cl<sub>2</sub> and BCl<sub>3</sub>, which would produce metal polymer on the pattern insulating film (col. 7, line 37-55); removing the photoresist and isotropically etching the insulating, this would also remove any metal polymer that forms on the insulating layer (col. 8, line 55; col. 9, line 25-32, 40-44).

Referring to claims 4 and 5, the insulating layer includes nitride and oxide (claimed top layer in the semiconductor structure).

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2, 3, 6, 7, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu as applied to claim 1 above, and further in view of Gutsche et al. (US 6,117,353).

Referring to claims 2 and 3, Liu doesn't describe the metal layer includes TiN below and above the Al, and a BARC between the photoresist and the insulating layer. This structure is typical and known to one skilled in the art as shown here by Gutsche (col. 1, line 25-45; col. 5, line 33-50). It would have been obvious for one skilled in the art to modify Liu in light of Gutsche's teaching in order to form a structure for forming a metal lines as taught by Gutsche (col. 1, line 5-19) with a reasonable expectation of success.

Referring to claim 7, Gutsche further teaches etching through the hard mask, which would includes etching the BARC and the insulating layer, using a mixture of CF<sub>4</sub>, CHF<sub>3</sub>, and Ar.

Referring to claim 11, Gutsche further teaches of cleaning the substrate after the etching process (col. 6, line 40-45).

5. Claim 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu and Gutsche as applied to claim 6 above, and further in view of Fujiwara et al. (US 6,232,209).

Referring to claim 8, above applied prior art doesn't describe etching the BARC and the insulating layer in a single etch step using gas mixture including CxFy, O<sub>2</sub>, and Ar. Fujiwara teaches an etching mixture for antireflective layer and the insulating layer including CF<sub>4</sub>, O<sub>2</sub>, and Ar (col. 11, line 41-55). It would have been obvious for one skilled in the art to etch the two layer in light of Fujiwara because he teaches another mixture that is known to one skilled in the

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art at the time of the invention to etch the two layer where the photoresist can be removed at the same time (col. 11, line 55-65) with a reasonable expectation of success.

6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liu, Gutsche, and Fujiwara as applied to claim 6 above, and further in view of Keil et al. (US 2002/0173160).

Referring to claim 9, Fujiwara further etching the antireflective and the insulating layer separately (col. 14, line 55-65). Unlike claimed invention, Fujiwara doesn't describe etching the antireflective using gas including N<sub>2</sub>. Keil teaches a mixture for etching antireflective including O<sub>2</sub>, N<sub>2</sub>, and Ar (claim 1; paragraph [0006]). It would have been obvious for one skilled in the art to etch the antireflective in light of Keil, when etching separately, since Keil teaches that the gas mixture would etch the antireflective layer selectively to the photoresist and the insulating layer (paragraph [0006]).

7. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liu as applied to claim 1 above, and further in view of Lin et al. (US 6,063,695).

Referring to claim 10, Liu is silent about the gas mixture for isotropic etching of the insulating layer; however, isotropic etching using O<sub>2</sub>/CF<sub>4</sub> for the insulating layer is well known to one skilled in the art as shown here by Lin (col. 5, line 35-45) (claimed down flow method). It would have been obvious for one skilled in the art to isotropically etch the insulating layer in light of Lin's teaching because Lin further describes the method and gas that is silent by Liu for the etching of the of the insulating layer with a reasonable expectation of success.

***Response to Arguments***

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8. Referring to applicant's argument that Liu fail to disclose a metal polymer as cited in claim 1, Liu describes using gas mixture of C<sub>2</sub>/BCl<sub>2</sub> to etch the metal line. Since they are similar to the claimed etching gas disclosed in page 6, line 21 of the specification, Liu's metal line etching would provide metal polymer on the insulating pattern 28. Furthermore, Liu describes isotropically etching the insulating pattern 28 (please see col. 9, line 25-32, 40-44), which is also cited in claim 1, any metal polymer on the insulating pattern 28 would also have to be removed along with the insulating film.

### *Conclusion*

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n. Deo whose telephone number is 571-272-1462. The examiner can normally be reached on 6:00-2:30 Mon-Fri.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Primary Examiner

Duy-Vu N. Deo

12/21/05

